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PATENT APPLICATION

#31
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J. Carter

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

MASATAKA YAMASHITA, ET AL.

Application No.: 09/250,400

Filed: February 16, 1999

For: METHODS FOR PRODUCING
ELECTRON-EMITTING
DEVICE, ELECTRON
SOURCE, AND IMAGE-
FORMING APPARATUS

Examiner: K. Ramsey

Group Art Unit: 2879

June 20, 2003

Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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REQUEST FOR RECONSIDERATION

Sir:

This Request For Reconsideration is filed in response to the Office Action
(Paper No. 30) of March 20, 2003.

This application has been reviewed in light of the Office Action dated March
20, 2003. Claims 1-5, 7-34, 36-38, and 40-47 remain pending in this application. Favorable
reconsideration is respectfully requested.

I hereby certify that this correspondence is being deposited with the
United States Postal Service as first-class mail in an envelope
addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria,
VA 22313-1450 on June 20, 2003.

(Date of Deposit)

FRANK A. DeLUCIA, JR. (REG. #42,476)

(Name of Attorney for Applicant)

Signature

June 20, 2003

Date of Signature

Claims 2, 14-17, 30, and 31 are independent claims.

In the Office Action, Claims 2-8, 11-17, 20-24, 27-41, and 44-47 were rejected under 35 U.S.C. § 103(a) as being unpatentable over either U.S. Patent 6,034,478 (Kawade et al.) or Japanese Patent Application No. Hei 09-298029 (JP09-298029) in view of JP 62-174840 (Banno et al.) and Japanese Patent Laid Open No. 6-12997 (Ueno et al.). Claims 9, 10, 25, 26, 42, and 43 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawade et al., Ueno et al., and Banno et al. in view of European Patent Application EP 0 769 796 A1 (Taiko et al.).

Applicants respectfully traverse the above rejections for the following reasons.

Claim 2 is directed to a method for producing electron-emitting devices, each including a pair of electrodes and an electroconductive film having an electron-emitting region. The electroconductive film is disposed between the pair of electrodes. The electron-emitting regions of the electron-emitting devices are formed by a process including the steps of preparing electroconductive films, and energizing the electroconductive films, while heating a substrate on which the electroconductive are disposed at a temperature not higher than 150°C within an atmosphere comprising a gas for promoting cohesion of the electroconductive films.

Kawade et al. and Japanese Patent Application No. Hei 09-298029 refer to an electroconductive film that is subjected to energization within an atmosphere for promoting cohesion of the electroconductive film. As a pulse voltage is applied between

device electrodes to cause electric current to flow through the electroconductive film, heat is thermally generated in the film itself as a result of that energization of the film.

The English translation of Japanese Patent Application No. Hei 09-298029 also discloses in paragraph (0070) that when an energization forming is conducted within a cohesion promoting gas atmosphere a consumption power energy would be reduced by several tens of percent rather than the consumption in a case of conducting the same process in an evacuated space conventionally. This is because, in such conventional process, due to the Joule heat generated by current flowing through the device, a temperature of the electroconductive film 3 increases, and local destruction and deforming or charging quality are caused, during formation of the electron-emitting portion 2. While, according to Japanese Patent Application No. Hei 09-298029, it is estimated that the substance promoting cohesion of the electroconductive film would promote the local destruction, deforming, or quality change of the electroconductive film, and results in decreasing power consumption for the processing. See also Kawade et al. at col. 12, lines 20-30.

Thus, since the energization forming within the atmosphere of promoting the cohesion can be performed in the low power consumption, the Joule heat generated during the energization forming within the cohesion promoting atmosphere would be smaller than that generated during the energization forming within the evacuated space in the conventional art, according to the English translation of Japanese Patent Application No. Hei 09-298029 and Kawade et al.

Banno et al. refers to an electroconductive film being heated by a heater 25 while the film is being energized (Fig. 2). A substrate is heated locally by Joule heat generated during energization forming, and is therefore likely to be cracked during the energization forming. In order to prevent the cracking, the substrate is heated while the energization forming is conducted. Banno et al. also refers to further conducting the energization forming within an atmosphere and an evacuated space.

Ueno et al. relates to a surface-conduction type of electron emitting device in which a position and shape of an electron emission portion are controlled. The English translation of Ueno et al. also teaches that a fine particle film 56 is subjected to energization forming. At that time, an atmosphere is formed by mixing Ar gas with H₂ gas by 5%. According to Ueno et al., conventionally, during a forming process within an atmosphere or evacuated space, heat of 10J is generated. According to the method of Ueno et al., the heat generated is 4J, that is, 40% of that in the conventional process. Thus, according to Ueno et al., the forming process within the atmosphere of H₂ gas (i.e., cohesion promoting gas) generates Joule heat smaller than that generated by the forming process in an atmosphere or an evacuated space.

Applicants respectfully submit that nothing in Kawade et al., JP09-298029, Banno et al., and Ueno et al., would teach or suggest producing electron-emitting devices, each including a pair of electrodes and an electroconductive film having an electron-emitting region, wherein the electroconductive film is disposed between the pair of electrodes, and the electron-emitting regions of the electron-emitting devices are formed by a process including the steps of preparing electroconductive films, and energizing the

electroconductive films, while heating a substrate on which the electroconductive are disposed at a temperature not higher than 150°C within an atmosphere comprising a gas for promoting cohesion of the electroconductive films, as recited in Claim 2.

The Office Action asserts that “as taught by Banno et al, translation, page 3, line 6 through page 5, line 9, it would have been known to one of ordinary skill in the art that the process of Kawade is desirably carried out after first preheating the substrate to avoid cracking due to thermal shock.” However, the heating of the substrate is used in Banno et al. for solving a problem in which there is greater (excess) Joule heat generated during energization forming within the space and the evacuated space. Such substrate heating would not be necessary in cases where there is smaller Joule heat generated, such as in cases where the forming process is performed within a cohesion promoting gas atmosphere, as in Kawade et al., JP09-298029, and Ueno et al. Accordingly, there would have been no reason why one skilled in the art would have been motivated to heat the substrate of Kawade et al. or JP09-298029 (or Ueno et al.), as in Banno et al., since the heating of the substrate in Banno et al. is employed to address excess generated Joule heat during energization forming, but would be unnecessary in cases where smaller Joule heat is generated, as in Kawade et al., JP09-298029, and Ueno et al.

For all of the foregoing reasons, Applicants respectfully submit that it would not have been obvious to one skilled in the art at the time of Applicants’ invention, to combine either Kawade et al. or JP09-298029 with Banno et al. and Ueno et al., in the manner proposed in the Office Action, in an attempt to provide the method recited in Claim 2.

Accordingly, Claim 2 is deemed clearly patentable over those references.

Independent Claims 14-17, 30, and 31 are each directed to a method which recites features that are similar in many relevant respects to those of Claim 2 discussed above relating forming plural electron-emitting devices by heating and energizing, and also are believed to be patentable over the art relied on in the Office Action for substantially the same reasons as is Claim 2.

A review of the other art of record, including Taiko et al., has failed to reveal anything which, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. Those claims are therefore believed patentable over the art of record.

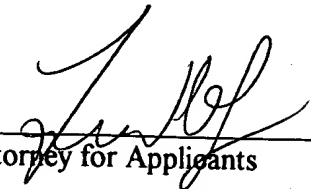
The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants' undersigned attorney may be reached in our New York office by

telephone at (212) 218-2100. All correspondence should continue to be directed to our
below listed address.

Respectfully submitted,



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